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PATENT COOPERATION TREATY

From the
INTERNATIONAL PRELIMINARY EXAMINING AUTHORITY

To:

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IP
time limit 25.02.2005

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NOTIFICATION OF TRANSMITTAL OF THE INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Rule 71.1)

Date of mailing *(day/month/year)*	25.01.2005
Applicant's or agent's file reference 2002P13595/P68/NC/kf	**IMPORTANT NOTIFICATION**

International application No.	International filing date *(day/month/year)*	Priority date *(day/month/year)*
PCT/EP 03/11652	20.10.2003	25.10.2002

Applicant
SIEMENS PLC. et al.

1. The applicant is hereby notified that this International Preliminary Examining Authority transmits herewith the international preliminary examination report and its annexes, if any, established on the international application.

2. A copy of the report and its annexes, if any, is being transmitted to the International Bureau for communication to all the elected Offices.

3. Where required by any of the elected Offices, the International Bureau will prepare an English translation of the report (but not of any annexes) and will transmit such translation to those Offices.

4. **REMINDER**

The applicant must enter the national phase before each elected Office by performing certain acts (filing translations and paying national fees) within 30 months from the priority date (or later in some Offices) (Article 39(1)) (see also the reminder sent by the International Bureau with Form PCT/IB/301).

Where a translation of the international application must be furnished to an elected Office, that translation must contain a translation of any annexes to the international preliminary examination report. It is the applicant's responsibility to prepare and furnish such translation directly to each elected Office concerned.

For further details on the applicable time limits and requirements of the elected Offices, see Volume II of the PCT Applicant's Guide.

The applicant's attention is drawn to Article 33(5), which provides that the criteria of novelty, inventive step and industrial applicability described in Article 33(2) to (4) merely serve the purposes of international preliminary examination and that "any Contracting State may apply additional or different criteria for the purposes of deciding whether, in that State, the claimed inventions is patentable or not" (see also Article 27(5)). Such additional criteria may relate, for example, to exemptions from patentability, requirements for enabling disclosure, clarity and support for the claims.

Name and mailing address of the international preliminary examining authority:	Authorized Officer
European Patent Office - P.B. 5818 Patentlaan 2 NL-2280 HV Rijswijk - Pays Bas Tel. +31 70 340 - 2040 Tx: 31 651 epo nl Fax: +31 70 340 - 3016	Vasilakis, S Tel. +31 70 340-1078

PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference 2002P13595/P68/NC/kf	**FOR FURTHER ACTION**	See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)
International application No. PCT/EP 03/11652	International filing date *(day/month/year)* 20.10.2003	Priority date *(day/month/year)* 25.10.2002
International Patent Classification (IPC) or both national classification and IPC H04J3/06		
Applicant SIEMENS PLC. et al.		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.

2. This REPORT consists of a total of 6 sheets, including this cover sheet.

   ☒ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

   These annexes consist of a total of 4 sheets.

3. This report contains indications relating to the following items:

   - I ☒ Basis of the opinion
   - II ☐ Priority
   - III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
   - IV ☐ Lack of unity of invention
   - V ☒ Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
   - VI ☐ Certain documents cited
   - VII ☐ Certain defects in the international application
   - VIII ☐ Certain observations on the international application

Date of submission of the demand	Date of completion of this report
07.05.2004	25.01.2005
Name and mailing address of the international preliminary examining authority: European Patent Office - P.B. 5818 Patentlaan 2 NL-2280 HV Rijswijk - Pays Bas Tel. +31 70 340 - 2040 Tx: 31 651 epo nl Fax: +31 70 340 - 3016	Authorized Officer Marongiu, M.T. Telephone No. +31 70 340-3610

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/EP 03/11652

I. Basis of the report

1. With regard to the **elements** of the international application *(Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17))*:

Description, Pages

1-18 as originally filed

Claims, Numbers

1-13 filed with telefax on 28.10.2004

Drawings, Sheets

1/2-2/2 as originally filed

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

   These elements were available or furnished to this Authority in the following language: , which is:

   ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).

   ☐ the language of publication of the international application (under Rule 48.3(b)).

   ☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

   ☐ contained in the international application in written form.

   ☐ filed together with the international application in computer readable form.

   ☐ furnished subsequently to this Authority in written form.

   ☐ furnished subsequently to this Authority in computer readable form.

   ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.

   ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

   ☐ the description, pages:

   ☐ the claims, Nos.:

   ☐ the drawings, sheets:

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)).

   (Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)

6. Additional observations, if necessary:

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes:	Claims	1-13
	No:	Claims	
Inventive step (IS)	Yes:	Claims	1-13
	No:	Claims	
Industrial applicability (IA)	Yes:	Claims	1-13
	No:	Claims	

2. Citations and explanations

   see separate sheet

Re Item V

Reasoned statement with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. The following documents are referred to in this communication; the numbering will be adhered to in the rest of the procedure:

   D1: EP-A-0 697 774 (HEWLETT PACKARD CO) 21 February 1996
   D2: US 2002/133733 A1 (ABDEL-GHAFFAR HISHAM S) 19 September 2002

2. Novelty and Inventive step

2.1 The document D1, regarded as being the closest prior art to the subject-matter of independent claim 1, discloses (the references in parentheses applying to this document):

a method for determining a timing offset between a first clock and a second clock at respective first and second points in a communication network (page 1, lines 43-44; page 4, lines 1-8; Fig.1);

transmitting a plurality of request signals from the first point in the network to the second point in the network (page 4, lines 14-16; page 4, lines 32-34; Fig.2(22));

receiving at the first point a plurality of reply signals transmitted from the second point, each reply signal corresponding to a respective one of a plurality of request signals (page 4, lines 14-16; page 4, lines 34-37; Fig.2(23));

identifying a first request signal and a corresponding reply signal having a minimum round trip delay (page 5, lines 4-7, lines 19-25);

determining from the minimum round trip delay a minimum single leg delay time (page 5, lines 4-7, lines 19-25);

estimating a timing offset between the clock values of the first clock and the second clock at the first instance, based upon the minimum single leg delay time and a transmission time and reception time of one of the identified request and reply signal given by the respective clocks at the transmission and reception

points of the signal (page 4, lines 55-58; page 5, lines 3-13, lines 19-25, lines 41-44; Fig.2).

identifying a second request signal and a second corresponding reply signal ("an estimate of the timing offset computed recursively": page 6, line 31, 41, 25; claim 1) having another minimum round trip delay time (page 4, lines 14-16, lines 34-37;) and estimating a second timing offset between the clock values of the first clock and the second clock at a second instant, the estimation being based upon the another minimum single leg delay time (page 5, lines 4-7, lines 19-25; page 5, lines 19-25) and a transmission time and a reception time of one of the second identified request signal and the second corresponding reply signal (page 5, lines 3-13), as given by the respective clocks at the transmission and reception points of the signal (page 5, lines 41-44).

2.2 The subject-matter of claim 1 differs from this known method in that the first and second estimated timing offsets are treated as two term of an arithmetic progression in order to estimate a third timing offset.

The subject-matter of claim 1 is therefore new (Article 33(2) PCT).

2.3 The problem to be solved by the present invention may be regarded as a long processing time to achieve a good precision in the estimation of the timing offsets.

2.4 The solution to this problem proposed in claim 1 is the use of an arithmetic progression to compute a new estimation of the current offset.

2.5 Document D2 describes a method for providing synchronization between distributed processors. The method comprises determining a desired number of offset values and determining parameters of a regression line, when the regression line is a function of the offset values (paragraphs: [0020][0076][0081]; Fig. 7), and using the line to estimate a new current offset (paragraph [0082]).

2.6 The sets of measurements and calculations performed in D1 are different from the sets of measurements taken in D2 and from the calculations performed in D2, so it is not obvious to combine the teaching of D2 with the teaching of D1 to arrive at the current invention.
The solution to the problem proposed in claim 1 of the present application is therefore considered as involving an inventive step (Article 33(3) PCT).

3. Dependent claims

3.1 Claims 2-13 are dependent on claim 1 and as such also meet the requirements of the PCT with respect to novelty and inventive step.

CLAIMS

1. A method for determining a timing offset between a first clock and a second clock at respective first and second points in a communications network, the method comprising:

transmitting a plurality of request signals from the first point in the network to the second point in the network;

receiving at the first point in the network a plurality of reply signals transmitted from the second point in the network, each reply signal corresponding to a respective one of the plurality of request signals;

identifying a first request signal and a corresponding reply signal having a minimum round trip delay time;

determining from the minimum round trip delay time a minimum single leg delay time;

estimating a timing offset between the clock values of the first clock and the second clock at a first instance, the estimation being based upon the minimum single leg delay time, and a transmission time and a reception time of one of the identified request signal and the corresponding reply signal, as given by the respective clocks at the transmission and reception points of the signal;

identifying a second request signal and a second corresponding reply signal having another minimum round trip delay time; and

estimating a second timing offset between the clock values of the first clock and the second clock at a second instant, the estimation being based upon the another minimum single leg delay time, and a transmission time and a reception time of one of the second identified

request signal and the second corresponding reply signal, as given by the respective clocks at the transmission and reception points of the signal;

using the first timing offset and the second timing offset to estimate a third timing offset between the first and second clocks at a third instance, wherein the first and second timing offsets are treated as two terms in an arithmetic progression in order to estimate the third timing offset.

2. A method according to claim 1, wherein the third timing offset is used to

calculate the clock value at the second clock at the third instance from the clock value at the first clock at the third instance.

3. A method according to claim 1 or 2, wherein the third timing offset is used to calculate a one way delay time of a signal

4. A method according to any preceding claim, wherein each reply signal includes information indicating the clock time at the first clock when the reply signal was transmitted from the first point in the network.

5. A method according to any preceding claim, wherein each reply signal includes information indicating the clock time at the second clock when the request signal corresponding to the reply signal was received at the second point in the network.

6. A method according to any preceding claim wherein each reply signal includes information indicating the clock time at the second clock when the reply signal was sent from the second point in the network.

8. A method according to any preceding claim, wherein each reply signal includes information indicating the clock time at the first clock when the request signal corresponding to the reply signal was sent from the first point in the network.

8. A method according to any preceding claim, wherein a minimum one way delay time is calculated as being half a minimum round trip delay.

9. A method according to any preceding claim, wherein the message and reply signals are packets.

10. A method according to claim 3, where the calculated one way delay time is that of a packet transmitted between the first and second points.

11. A method according to claim 10 wherein the packet is a VOIP packet.

12. A computer programme arranged to perform the method of any preceding claim when executed by a suitably arranged processing device.

13. A processing device programmed with the computer programme claimed in claim 12.